

**REMARKS**

Claims 1, 2, 15, 16, 20 and 34 have been amended in order to correct the informalities noted by the Examiner on page 2 of the Final Office Action. Accordingly, Applicants request that the objections to claims 1, 2, 15, 16, 20 and 34 be reconsidered and withdrawn.

Claim 16 has also been amended to recite “wherein the (A) is a polyisocyanate component having an” before the term “isocyanate group.” Applicants note that this phrase was inadvertently deleted from claim 16 in the Amendment under 37 C.F.R. § 1.111 filed October 22, 2003.

Claim 25 has been amended in that “claim 5” has been deleted and replaced with “Claim 5.” Claim 34 has also been amended to delete the extraneous comma between “alicyclic” and “isocyanate” on line 6.

New claims 45-52 have been added. Applicants respectfully request that claims 45-52 be entered. Entry of the Amendment is requested as placing the application in better form for appeal.

Upon entry of the foregoing amendments, claims 1-52 will be pending in the application.

**Response to the Rejection of Claims 1-44 under 35 U.S.C. § 103**

On page 2 of the Final Office Action, claims 1-44 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 3,799,380 to Hashimoto et al. (“Hashimoto”) in view of M. Szycher; *Polyurethanes*; 1999 (“Szycher”).

Hashimoto is relied upon as teaching sealing gaskets made from polyurethane prepolymers which have a functionality of 2-3 and a isocyanate group content that falls within

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the presently claimed range, and polyols having OH numbers of 56 and 67 and functionalities of 2-3.

Szycher is relied upon as disclosing that cycloaliphatic polyisocyanates are more hydrolytically stable than the aromatic polyisocyanate diphenylmethane.

The present invention relates to a sealing gasket for closure comprising a particular polyurethane elastomer having low hardness and resistance to yellowing. The claimed sealing gasket is usable for the hygienic storage of food. The present invention also relates to a process for producing a closure using the sealing gasket.

The polyurethane elastomer of the present invention is obtained by reacting (A) a polyisocyanate component, which has an isocyanate content of 5-38% by weight and an average of 2 to 3 functional groups and is obtained by modifying an aliphatic isocyanate and/or an alicyclic isocyanate, and (B) the claimed polyol component.

*Applicants' Response to the Rejection*

Applicants respectfully submit that the presently claimed polyurethane elastomer is not disclosed in Hashimoto and that one of ordinary skill in the art would not be motivated to arrive at the present invention by the teachings of Hashimoto and Szycher.

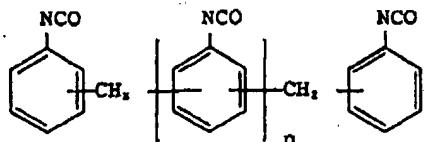
Hashimoto relates to a bottle cap comprising a cap member and a polyurethane gasket. The gasket of Hashimoto comprises a polyol and a quasi-prepolymer of a polymethylene polyphenyl-isocyanate.

This polymethylene polyphenylisocyanate is a mixture of a homologous series of diphenylmethane diisocyanate and its polymers generally shown by the following formula.

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*See col. 5, lines 22-40.*

A main component of the mixture is 4,4'-diphenylmethane diisocyanate. When 4,4'-diphenylmethane diisocyanate is hydrolyzed, it becomes 4,4'-diaminodiphenylmethane.

Applicants note that these compounds have a very high carcinogenicity and/or mutagenicity. As evidence of the mutagenicity and carcinogenicity of these compounds, Applicants submit herewith information provided on the National Institute of Health's Toxnet Web site. Appendix 2 illustrates the mutagenic qualities of polymethylenepolyphenyl isocyanate. *See "Polymethylenepolyphenyl isocyanate" at* [\*http://toxnet.nlm.nih.gov\*](http://toxnet.nlm.nih.gov)*. Appendix 3 illustrates the mutagenic qualities of 4,4'-methylenediphenyl diisocyanate. *See "4,4'-methylenediphenyl diisocyanate" at* [\*http://toxnet.nlm.nih.gov\*](http://toxnet.nlm.nih.gov)*. Appendix 4 illustrates the carcinogenic and mutagenic qualities of 4,4'-methylenebis(aniline). *See "4,4'-methylenebis(aniline)" at* [\*http://toxnet.nlm.nih.gov\*](http://toxnet.nlm.nih.gov)*.***

In view of the carcinogenic and mutagenic qualities of the compounds used in Hashimoto, these compounds cannot be used in the production of a polyurethane elastomer suitable for the hygienic storage of food.

In the present invention, however, the claimed aliphatic isocyanates, such as hexamethylene diisocyanate, the claimed alicyclic isocyanates, such as isophorone diisocyanate, and their decomposition products (via hydrolyzation), *i.e.*, hexamethylene diamine and isophorone diamine) all have low carcinogenicity. *See, e.g., Appendices 5-8.*

Appendix 5 demonstrates that 1,6-hexamethylene diisocyanate tests negative for mutagenicity in Ames Salmonella typhimurium and Chinese hamster ovary cell testing. *See* “1,6-hexamethylene diisocyanate” at <http://toxnet.nlm.nih.gov>. Appendix 6 demonstrates that isophorone diisocyanate tests negative for mutagenicity in Ames Salmonella typhimurium. *See* “Isophorone diisocyanate” at <http://toxnet.nlm.nih.gov>. Appendix 7 demonstrates that 1,6-diaminohexane tests negative for mutagenicity in Ames Salmonella typhimurium. *See* “1,6-diaminohexane” at <http://toxnet.nlm.nih.gov>. Appendix 7 demonstrates that isophoronediamine tests negative for mutagenicity in Ames Salmonella typhimurium. *See* “Isophoronediamine” at <http://toxnet.nlm.nih.gov>.

In addition, the mutagenicity of a polyisocyanate B (*i.e.*, carbamic acid, (6-isocyanatoethyl)-l-methyl-l,3-propanediyl ester obtained by reacting hexamethylene diisocyanate and 1,3-butanediol in Synthesis Example 2 in the present specification) tested negative for mutagenicity. *See* Appendix 9.

Applicants respectfully submit that, in view of the safety of the presently claimed sealing gasket compared to that of Hashimoto, one of ordinary skill in the art would not be motivated to arrive at the present invention from the teachings of the prior art.

Applicants additionally assert that the sealing gaskets of Hashimoto produced from aromatic polyisocyanates experience yellowing over time. Thus, it is impossible to produce a molded polyurethane elastomer that is resistant to yellowing using 4,4'-diphenylmethane diisocyanate or tolylene diisocyanate.

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In the present invention, however, aliphatic isocyanates, such as hexamethylene diisocyanate, and alicyclic isocyanates, such as isophorone diisocyanate, when used to produce a polyurethane elastomer, do not cause yellowing. Examples 1 to 9 and Comparative Examples 1 and 2 in Table 1 of the present specification demonstrate the unexpectedly superior resistance of the present invention to yellowing (weather resistance). Applicants note that Comparative Example 1 employs the aromatic polyisocyanate diphenylmethane, which is also used in Hashimoto.

As further evidence of the nonobviousness of the present invention, Applicants note that claim 1 of Hashimoto recites a polyurethane gasket having a hardness of “from about shore A 50° to about shore A 60°, a tensile strength of from about 20 to about 30 kilograms per square centimeter and an elongation at break of from about 90 to about 110 percent.”

On the other hand, the polyurethane elastomer in Examples 1 to 11 of the present invention has the hardness (JIB A) of 55 to 70, TB (tensile strength) of 10 to 35 MPa (equal to 98 to 343 kg/cm<sup>2</sup>) and EB (elongation at break) of 300 to 590%. Thus, the polyurethane elastomer of the present invention is superior to the polyurethane elastomer of Hashimoto with respect to tensile strength and elongation at break.

Applicants additionally submit that Hashimoto is silent with respect to the potassium permanganate consumption of the elastomer described therein.

In the present invention, the polyurethane elastomer, when subjected to a retort treatment of 120°C x 30 minutes using 10 ml/g (of the polyurethane elastomer) water, yields an extract showing a potassium permanganate consumption of 30 ppm or less.

In Examples 1-11 of the present specification, the elastomers described therein yield an extract having a potassium permanganate consumption of 0.6-9 ppm. Applicants note that current claims 22-33, 36, 38, 40, 42 and 45-52 are supported by these data. Comparative Example 3, produced using TDI, demonstrates a potassium permanganate consumption of 33 ppm.

Furthermore, although Hashimoto discloses that the gasket described therein does not experience weight loss of over time and Szycher discloses that cycloaliphatic polyisocyanates are more hydrolytically stable than aromatic polyisocyanates, such as diphenylethane, there is no teaching in either reference to indicate that an extract showing a low potassium permanganate consumption would be obtained.

Applicants further note that the extraction condition in the present invention differs from the conditions for measuring weight lose in Hashimoto.

Accordingly, Applicants respectfully request that the rejection of claims 1-44 be reconsidered and withdrawn.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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WASHINGTON OFFICE  
**23373**  
CUSTOMER NUMBER

Date: May 3, 2004

**POLYMETHYLENEPOLYPHENYL ISOCYANATE**

CASRN: 9016-87-9

For other data, click on the Table of Contents

**Substance Identification:****Substance Name:** POLYMETHYLENEPOLYPHENYL ISOCYANATE**CAS Registry Number:** 9016-87-9**Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:****Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (30%)**Method:** STANDARD PLATE**Dose:** 20-2500 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** POSITIVE**Reference:**

[HERBOLD, B, HAAS, P, SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOUR TYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412 (2) :167-175, 1998]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA98**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (30%)**Method:** STANDARD PLATE**Dose:** 20-2500 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** POSITIVE**Reference:**

[HERBOLD, B, HAAS, P, SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOUR TYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412 (2) :167-175, 1998]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (30%)**Method:** STANDARD PLATE**Dose:** 8-5000 UG/PLATE (TEST MATERIAL SOLVENT: ETHYLENEGLYCOLDIMETHYLETHER)

**Results:** NEGATIVE

**Reference:**

[HERBOLD, B, HAAS, P, SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOUR TYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412 (2) :167-175, 1998]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA98

**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (30%)

**Method:** STANDARD PLATE

**Dose:** 8-5000 UG/PLATE (TEST MATERIAL SOLVENT:  
ETHYLENEGLYCOLDIMETHYLETHER)

**Results:** NEGATIVE

**Reference:**

[HERBOLD, B, HAAS, P, SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOUR TYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412 (2) :167-175, 1998]

### **Administrative Information:**

**CCRIS Record Number:** 8161

**Last Revision Date:** 20000616

### **Update History:**

Complete Update on 06/16/2000, 4 fields added/edited/deleted.

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**4,4'-METHYLENEDIPHENYL DIISOCYANATE**

CASRN: 101-68-8

*For other data, click on the Table of Contents***Substance Identification:****Substance Name:** 4,4'-METHYLENEDIPHENYL DIISOCYANATE**CAS Registry Number:** 101-68-8**Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:****Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA98**Metabolic Activation:** NONE**Method:** PREINCUBATION**Dose:** 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** NEGATIVE**Reference:**

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27 (6):400-419, 1985]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** NONE**Method:** PREINCUBATION**Dose:** 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** NEGATIVE**Reference:**

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27 (6):400-419, 1985]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA1535**Metabolic Activation:** NONE**Method:** PREINCUBATION

**4,4'-METHYLENEDIPHENYL DIISOCYANATE**

CASRN: 101-68-8

For other data, click on the Table of Contents

**Substance Identification:****Substance Name:** 4,4'-METHYLENEDIPHENYL DIISOCYANATE**CAS Registry Number:** 101-68-8**Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:**

<b>Test System:</b>	AMES SALMONELLA TYPHIMURIUM
<b>Strain Indicator:</b>	TA98
<b>Metabolic Activation:</b>	NONE
<b>Method:</b>	PREINCUBATION
<b>Dose:</b>	5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)
<b>Results:</b>	NEGATIVE
<b>Reference:</b>	

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S. AND MATSUSHITA, H.; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

<b>Test System:</b>	AMES SALMONELLA TYPHIMURIUM
<b>Strain Indicator:</b>	TA100
<b>Metabolic Activation:</b>	NONE
<b>Method:</b>	PREINCUBATION
<b>Dose:</b>	5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)
<b>Results:</b>	NEGATIVE
<b>Reference:</b>	

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S. AND MATSUSHITA, H.; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

<b>Test System:</b>	AMES SALMONELLA TYPHIMURIUM
<b>Strain Indicator:</b>	TA1535
<b>Metabolic Activation:</b>	NONE
<b>Method:</b>	PREINCUBATION
<b>Dose:</b>	5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)
<b>Results:</b>	NEGATIVE
<b>Reference:</b>	

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S. AND MATSUSHITA, H.; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

<b>Test System:</b>	AMES SALMONELLA TYPHIMURIUM
<b>Strain Indicator:</b>	TA1537
<b>Metabolic Activation:</b>	NONE
<b>Method:</b>	PREINCUBATION
<b>Dose:</b>	5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)
<b>Results:</b>	NEGATIVE
<b>Reference:</b>	

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S. AND MATSUSHITA, H.; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE

INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1538  
 Metabolic Activation: NONE  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA98  
 Metabolic Activation: RAT, LIVER, S-9, KC 500  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA100  
 Metabolic Activation: RAT, LIVER, S-9, KC 500  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATEIAL SOLVENT: DMSO)  
 Results: POSITIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1535  
 Metabolic Activation: RAT, LIVER, S-9, KC 500  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATEIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1537  
 Metabolic Activation: RAT, LIVER, S-9, KC 500  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1538

Metabolic Activation: RAT, LIVER, S-9, KC 500  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: E. COLI  
 Strain Indicator: WP2 UVRA  
 Metabolic Activation: NONE  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: E. COLI  
 Strain Indicator: WP2 UVRA  
 Metabolic Activation: RAT, LIVER, S-9, KC 500  
 Method: PREINCUBATION  
 Dose: 5-5000 UG/PLATE (TEST MATEIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[SHIMIZU, H., SUZUKI, Y., TAKEMURA, N., GOTO, S AND MATSUSHITA, H; RESULTS OF MICROBIAL MUTATION TEST FOR FORTY-THREE INDUSTRIAL CHEMICALS; SANGYO IGAKU 27(6):400-419, 1985]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA100  
 Metabolic Activation: NONE  
 Method: PREINCUBATION  
 Dose: 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[ZBIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL.9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA100  
 Metabolic Activation: HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
 Method: PREINCUBATION  
 Dose: 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[ZBIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL.9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA100  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (10%)  
 Method: PREINCUBATION  
 Dose: 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE

**Reference:**

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL. 9):1-110, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL. 9):1-110, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL. 9):1-110, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL. 9):1-110, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL. 9):1-110, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLOR, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL. 9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1535  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (10%)  
 Method: PREINCUBATION  
 Dose: 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLER, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL.9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1537  
 Metabolic Activation: NONE  
 Method: PREINCUBATION  
 Dose: 10-1000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLER, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL.9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1537  
 Metabolic Activation: HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
 Method: PREINCUBATION  
 Dose: 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLER, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL.9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA1537  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (10%)  
 Method: PREINCUBATION  
 Dose: 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: NEGATIVE  
 Reference:

[ZEIGER, E., ANDERSON, B., HAWORTH, S., LAWLER, T., MORTELMANS, K AND SPECK, W; SALMONELLA MUTAGENICITY TESTS: III. RESULTS FROM THE TESTING OF 255 CHEMICALS; ENVIRON. MOL. MUTAGEN. 9(SUPPL.9):1-110, 1987]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA100  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (30%)  
 Method: STANDARD PLATE  
 Dose: 4-2500 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: POSITIVE  
 Reference:

(HERBOLD, B., HAAS, P., SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLEETHER ON THE MUTAGENICITY OF FOUR TYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOOME TEST; MUTAT. RES. 412(2):167-175, 1998) 

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA98  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (30%)

Method: STANDARD PLATE  
 Dose: 4-2500 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
 Results: POSITIVE  
 Reference:

[HERBOLD, B., HAAS, P., SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOURTYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412(2):167-175, 1998]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA100  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (30%)  
 Method: STANDARD PLATE  
 Dose: 150-2400 UG/PLATE (TEST MATERIAL SOLVENT: ETHYLENEGLYCOLDIMETHYLETHER)  
 Results: NEGATIVE  
 Reference:

[HERBOLD, B., HAAS, P., SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOURTYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412(2):167-175, 1998]

Test System: AMES SALMONELLA TYPHIMURIUM  
 Strain Indicator: TA98  
 Metabolic Activation: RAT, LIVER, S-9, AROCLOR 1254 (30%)  
 Method: STANDARD PLATE  
 Dose: 8-1000 UG/PLATE (TEST MATERIAL SOLVENT: ETHYLENEGLYCOLDIMETHYLETHER)  
 Results: NEGATIVE  
 Reference:

[HERBOLD, B., HAAS, P., SEEL, K AND WALBER, U; STUDIES ON THE EFFECT OF THE SOLVENTS DIMETHYLSULFOXIDE AND ETHYLENEGLYCOLDIMETHYLETHER ON THE MUTAGENICITY OF FOURTYPES OF DIISOCYANATES IN THE SALMONELLA/MICROSOME TEST; MUTAT. RES. 412(2):167-175, 1998]

#### Administrative Information:

CCRIS Record Number: 2303

Last Revision Date: 20000616

#### Update History:

Complete Update on 06/16/2000, 2 fields added/edited/deleted.  
 Complete Update on 09/10/1993, 5 fields added/edited/deleted.  
 Complete Update on 07/22/1993, 3 fields added/edited/deleted.  
 Complete Update on 10/22/1990, 6 fields added/edited/deleted.

**4,4'-METHYLENEBIS(ANILINE)**

CASRN: 101-77-9

For other data, click on the Table of Contents

**Substance Identification:****Substance Name:** 4,4'-METHYLENEBIS(ANILINE)**CAS Registry Number:** 101-77-9**Data Type:**

Carcinogenicity

Tumor Promotion

Mutagenicity

**Studies Data:****Carcinogenicity Studies:**

**Species:** RAT  
**Strain/Sex:** F344/MALE  
**Route:** ORAL  
**Dose:** 0; 0.15; 0.03% IN DIET FOR 103 WK (STUDY DURATION: 104 WK)  
**Tumor Site/ Type of Lesion:** THYROID GLAND: FOLLICULAR CARCINOMA; LIVER: NEOPLASTIC NODULE  
**Results:** POSITIVE  
**Reference:**

[WEISBURGER, EK, MURTHY, ASK, LILJA, HS AND LAMB, JC; NEOPLASTIC RESPONSE OF F344 RATS AND B6C3F1 MICE TO THE POLYMER AND DYESTUFF INTERMEDIATES 4, 4'-METHYLENEBIS (N, N-DIMETHYL) BENZENAMINE, 4, 4'-OXYDIANILINE AND 4, 4'-METHYLENEDIANILINE; J. NATL. CANCER INST. 72 (6):1457-1463, 1984]

**Species:** RAT  
**Strain/Sex:** F344/FEMALE  
**Route:** ORAL  
**Dose:** 0; 0.015; 0.03% IN DIET FOR 103 WK (STUDY DURATION: 104 WK)  
**Tumor Site/ Type of Lesion:** THYROID GLAND: FOLLICULAR ADENOMA  
**Results:** POSITIVE  
**Reference:**

[WEISBURGER, EK, MURTHY, ASK, LILJA, HS AND LAMB, JC; NEOPLASTIC RESPONSE OF F344 RATS AND B6C3F1 MICE TO THE POLYMER AND DYESTUFF INTERMEDIATES 4, 4'-METHYLENEBIS (N, N-DIMETHYL) BENZENAMINE, 4, 4'-OXYDIANILINE AND 4, 4'-METHYLENEDIANILINE; J. NATL. CANCER INST. 72 (6):1457-1463, 1984]

**Species:** MOUSE  
**Strain/Sex:** B6C3F1/MALE  
**Route:** ORAL

**Dose:** 0; 0.015; 0.03% IN DIET FOR 103 WK (STUDY DURATION: 104 WK)  
**Tumor Site/ Type of Lesion:** THYROID GLAND: FOLLICULAR ADENOMA; LIVER: HEPATOCELLULAR CARCINOMA  
**Results:** POSITIVE  
**Reference:**

[WEISBURGER, EK, MURTHY, ASK, LILJA, HS AND LAMB, JC; NEOPLASTIC RESPONSE OF F344 RATS AND B6C3F1 MICE TO THE POLYMER AND DYESTUFF INTERMEDIATES 4,4'-METHYLENEBIS (N,N-DIMETHYL) BENZENAMINE, 4,4'-OXYDIANILINE AND 4,4'-METHYLENEDIANILINE; J. NATL. CANCER INST. 72(6):1457-1463, 1984]

**Species:** MOUSE  
**Strain/Sex:** B6C3F1/FEMALE  
**Route:** ORAL  
**Dose:** 0; 0.015; 0.03% IN DIET FOR 103 WK (STUDY DURATION: 104 WK)  
**Tumor Site/ Type of Lesion:** THYROID GLAND: FOLLICULAR ADENOMA; LIVER: HEPATOCELLULAR ADENOMA; LIVER: HEPATOCELLULAR CARCINOMA  
**Results:** POSITIVE  
**Reference:**

[WEISBURGER, EK, MURTHY, ASK, LILJA, HS AND LAMB, JC; NEOPLASTIC RESPONSE OF F344 RATS AND B6C3F1 MICE TO THE POLYMER AND DYESTUFF INTERMEDIATES 4,4'-METHYLENEBIS (N,N-DIMETHYL) BENZENAMINE, 4,4'-OXYDIANILINE AND 4,4'-METHYLENEDIANILINE; J. NATL. CANCER INST. 72(6):1457-1463, 1984]

#### Tumor Promotion Studies:

**Species:** RAT  
**Strain/Sex:** WISTAR/MALE  
**Route (Promoter):** ORAL  
**Dose (Promoter):** 0; 1000 PPM IN DIET FOR 19 WK (STUDY DURATION: 19 WK)  
**Carcinogen:** 2,2'-DIHYDROXY-N-NITROSODIPROPYLAMINE ; 53609-64-6  
**Route (Carcinogen):** INTRAPERITONEAL  
**Dose (Carcinogen):** 280 MG/100 G IN 0.5 ML SALINE ONCE  
**Target Tissue: Type of Lesion:** THYROID: TUMOR  
**Reference:**

[HIASA, Y, KITAHORI, Y, ENOKI, N, KONISHI, N AND SHIMOBAYAMA, T; 4,4'-DIAMINODIPHENYL-METHANE: PROMOTING EFFECT ON THE DEVELOPMENT OF THYROID TUMORS IN RATS TREATED WITH N-BIS(2-HYDROXYPROPYL) NITROSAMINE; JNCI, J. NATL. CANCER INST. 72(2):471- 476, 1984]

**Species:** RAT  
**Strain/Sex:** F344/MALE  
**Route (Promoter):** ORAL  
**Dose (Promoter):** 0; 0.1% IN DIET BEGINNING 1 WK POST LAST CARCINOGEN DOSE AND CONTINUING FOR 12 WK (STUDY DURATION: 16 WK)

**Carcinogen:** N-BIS(2-HYDROXYPROPYL)NITROSAMINE ; 53609-64-6 ; N-ETHYL-N-HYDROXYETHYLNITROSAMINE ; 13147-25-6 ; 3,2'-DIMETHYL-4-AMINOBIPHENYL ; 13394-86-0

**Route (Carcinogen):** INTRAPERITONEAL ; Gavage ; Subcutaneous

**Dose (Carcinogen):** 1000 MG/KG IP IN SALINE ON DAY 1 AND 4 ; 1500 MG/KG IG IN DISTILLED WATER ON DAY 8 AND 11 ; 75 MG/KG SC IN CORN OIL ON DAY 15 AND 18

**Target Tissue: Type of Lesion:** THYROID: ADENOMA, ADENOCARCINOMA

**Reference:**

[UWAGAWA, S, TSUDA, H, OZAKI, K, TAKAHASHI, S, YAMAGUCHI, S, MUTAI, M, AOKI, T AND ITO, N; MODIFYING EFFECTS OF VARIOUS CHEMICALS ON TUMOR DEVELOPMENT IN A RAT WIDE-SPECTRUM ORGAN CARCINOGENESIS MODEL; JPN. J. CANCER RES. 83(8):812-820, 1992]

### Mutagenicity Studies:

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA100

**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254

**Method:** STANDARD PLATE

**Dose:** 0.01-10 UMOL/PLATE (TEST MATERIAL SOLVENT: DMSO)

**Results:** POSITIVE

**Reference:**

[MESSERLY, EA, FEKETE, JE, WADE, DR AND SINSHEIMER, JE; STRUCTURE-MUTAGENICITY RELATIONSHIP OF BENZIDINE ANALOGUES; ENVIRON. MOL. MUTAGEN. 10:263-274, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA100

**Metabolic Activation:** NONE

**Method:** STANDARD PLATE

**Dose:** 0.01-10 UMOL/PLATE (TEST MATERIAL SOLVENT: DMSO)

**Results:** NEGATIVE

**Reference:**

[MESSERLY, EA, FEKETE, JE, WADE, DR AND SINSHEIMER, JE; STRUCTURE-MUTAGENICITY RELATIONSHIP OF BENZIDINE ANALOGUES; ENVIRON. MOL. MUTAGEN. 10:263-274, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA98

**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254

**Method:** STANDARD PLATE

**Dose:** 0.01-10 UMOL/PLATE (TEST MATERIAL SOLVENT: DMSO)

**Results:** POSITIVE

**Reference:**

[MESSERLY, EA, FEKETE, JE, WADE, DR AND SINSHEIMER, JE; STRUCTURE-MUTAGENICITY RELATIONSHIP OF BENZIDINE ANALOGUES; ENVIRON. MOL. MUTAGEN. 10:263-274, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** STANDARD PLATE  
**Dose:** 0.01-10 UMOL/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MESSERLY, EA, FEKETE, JE, WADE, DR AND SINSHEIMER, JE; STRUCTURE-MUTAGENICITY RELATIONSHIP OF BENZIDINE ANALOGUES; ENVIRON. MOL. MUTAGEN. 10:263-274, 1987]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** STANDARD PLATE  
**Dose:** 10-1000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[TANAKA, K, INO, T, SAWAHATA, T, MARUI, S, IGAKI, H AND YASHIMA, H; MUTAGENICITY OF N-ACETYL AND N,N'-DIACETYL DERIVATIVES OF 3 AROMATIC AMINES USED AS EPOXY-RESIN HARDENERS; MUTAT. RES. 143(1-2):11-15, 1985]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** NONE  
**Method:** STANDARD PLATE  
**Dose:** 10-1000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[TANAKA, K, INO, T, SAWAHATA, T, MARUI, S, IGAKI, H AND YASHIMA, H; MUTAGENICITY OF N-ACETYL AND N,N'-DIACETYL DERIVATIVES OF 3 AROMATIC AMINES USED AS EPOXY-RESIN HARDENERS; MUTAT. RES. 143(1-2):11-15, 1985]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, PCB  
**Method:** STANDARD PLATE  
**Dose:** 10-1000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** POSITIVE  
**Reference:**

[TANAKA, K, INO, T, SAWAHATA, T, MARUI, S, IGAKI, H AND YASHIMA, H; MUTAGENICITY OF N-ACETYL AND N,N'-DIACETYL DERIVATIVES OF 3 AROMATIC AMINES USED AS EPOXY-RESIN HARDENSERS; MUTAT. RES. 143(1-2):11-15, 1985]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100

**Metabolic Activation:** RAT, LIVER, S-9, PCB  
**Method:** STANDARD PLATE  
**Dose:** 10-1000 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** POSITIVE  
**Reference:**

[TANAKA, K, INO, T, SAWAHATA, T, MARUI, S, IGAKI, H AND YASHIMA, H; MUTAGENICITY OF N-ACETYL AND N,N'-DIACETYL DERIVATIVES OF 3 AROMATIC AMINES USED AS EPOXY-RESIN HARDENERS; MUTAT. RES. 143(1-2):11-15, 1985]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Results:** NEGATIVE  
**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Results:** NEGATIVE  
**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT, LIVER, S-9, PCB  
**Method:** PREINCUBATION  
**Results:** POSITIVE  
**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, PCB  
**Method:** PREINCUBATION  
**Results:** POSITIVE  
**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** UDS RAT HEPATOCYTES  
**Strain Indicator:** BROMODEOXYURIDINE INCORP  
**Metabolic Activation:** NONE  
**Method:** FLOW CYTOMETRIC ANALYSIS  
**Dose:** 0.001-0.5 MILLIMOLAR (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[SELDEN, JR, DOLBEARE, F, CLAIR, JH, MILLER, JE, MCGETTIGAN, K, DIJOHN, JA, DYSART, GR AND DELUCA, JG; VALIDATION OF A FLOW CYTOMETRIC IN VITRO DNA REPAIR (UDS) ASSAY IN RAT HEPATOCYTES; MUTAT. RES. 315(2):147-167, 1994]

**Test System:** UDS RAT HEPATOCYTES  
**Strain Indicator:** THY INCORP  
**Metabolic Activation:** NONE  
**Method:** AUTORADIOGRAPHY  
**Dose:** 0.001-0.5 MILLIMOLAR (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[SELDEN, JR, DOLBEARE, F, CLAIR, JH, MILLER, JE, MCGETTIGAN, K, DIJOHN, JA, DYSART, GR AND DELUCA, JG; VALIDATION OF A FLOW CYTOMETRIC IN VITRO DNA REPAIR (UDS) ASSAY IN RAT HEPATOCYTES; MUTAT. RES. 315(2):147-167, 1994]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 1 MG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[TSUCHIYA, Y; CHLORINATION BYPRODUCTS OF 4,4'-METHYLENE DIANILINE (MDA) AND THEIR MUTAGENICITY; WATER SCI. TECHNOL. 30(10):153-159, 1994]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, PHENOBARBITAL  
**Method:** PREINCUBATION  
**Dose:** 1 MG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[TSUCHIYA, Y; CHLORINATION BYPRODUCTS OF 4,4'-METHYLENE DIANILINE (MDA) AND THEIR MUTAGENICITY; WATER SCI. TECHNOL. 30(10):153-159, 1994]

**Test System:** AMES SALMONELLA TYPHIRMURIUM  
**Strain Indicator:** TA100

**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 1 MG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[TSUCHIYA, Y; CHLORINATION BYPRODUCTS OF 4,4'-METHYLENE DIANILINE(MDA) AND THEIR MUTAGENICITY; WATER SCI. TECHNOL. 30(10):153-159, 1994]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT, LIVER, S-9, PHENOBARBITAL  
**Method:** PREINCUBATION  
**Dose:** 1 MG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** POSITIVE  
**Reference:**

[TSUCHIYA, Y; CHLORINATION BYPRODUCTS OF 4,4'-METHYLENE DIANILINE(MDA) AND THEIR MUTAGENICITY; WATER SCI. TECHNOL. 30(10):153-159, 1994]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254  
**Method:** STANDARD PLATE  
**Dose:** 25-100 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** POSITIVE  
**Reference:**

[HAMZAH, RY AND EL-TORKEY, NM; MUTAGENIC ACTIVITIES OF AROMATIC AMINES IN SALMONELLA TYPHIMURIUM AND ITS EFFECT ON RAT DRUG METABOLIZING ENZYMES; ARAB GULF J. SCI. RES. 13(1):13-23, 1995]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254  
**Method:** STANDARD PLATE  
**Dose:** 25-100 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** POSITIVE  
**Reference:**

[HAMZAH, RY AND EL-TORKEY, NM; MUTAGENIC ACTIVITIES OF AROMATIC AMINES IN SALMONELLA TYPHIMURIUM AND ITS EFFECT ON RAT DRUG METABOLIZING ENZYMES; ARAB GULF J. SCI. RES. 13(1):13-23, 1995]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION

**Results:** NEGATIVE

**Reference:**

[TAKAGI, Y, ENDOH, O, GOTO, S, KOHZAKI, K AND MATSUSHITA, H; MUTAGENICITY OF DIAMINODIPHENYLMETHANE AND RELATED COMPOUNDS; KANKYO KAGAKU 5(4):841-845, 1995]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA98

**Metabolic Activation:** RAT, LIVER, S-9, PCB

**Method:** PREINCUBATION

**Results:** POSITIVE

**Reference:**

[TAKAGI, Y, ENDOH, O, GOTO, S, KOHZAKI, K AND MATSUSHITA, H; MUTAGENICITY OF DIAMINODIPHENYLMETHANE AND RELATED COMPOUNDS; KANKYO KAGAKU 5(4):841-845, 1995]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA100

**Metabolic Activation:** NONE

**Method:** PREINCUBATION

**Results:** NEGATIVE

**Reference:**

[TAKAGI, Y, ENDOH, O, GOTO, S, KOHZAKI, K AND MATSUSHITA, H; MUTAGENICITY OF DIAMINODIPHENYLMETHANE AND RELATED COMPOUNDS; KANKYO KAGAKU 5(4):841-845, 1995]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA100

**Metabolic Activation:** RAT, LIVER, S-9, PCB

**Method:** PREINCUBATION

**Results:** POSITIVE

**Reference:**

[TAKAGI, Y, ENDOH, O, GOTO, S, KOHZAKI, K AND MATSUSHITA, H; MUTAGENICITY OF DIAMINODIPHENYLMETHANE AND RELATED COMPOUNDS; KANKYO KAGAKU 5(4):841-845, 1995]

## Administrative Information:

**CCRIS Record Number:** 1010

**Last Revision Date:** 19991214

## Update History:

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Complete Update on 04/16/1997, 2 fields added/edited/deleted.

Complete Update on 10/02/1995, 2 fields added/edited/deleted.

Complete Update on 08/02/1995, 1 field added/edited/deleted.

Complete Update on 06/06/1994, 2 fields added/edited/deleted.

Complete Update on 12/03/1993, 2 fields added/edited/deleted.  
Complete Update on 10/19/1989, 3 fields added/edited/deleted.  
Complete Update on 04/28/1989, 6 fields added/edited/deleted.

**1,6-HEXAMETHYLENE DIISOCYANATE**

CASRN: 822-06-0

*For other data, click on the Table of Contents***Substance Identification:****Substance Name:** 1,6-HEXAMETHYLENE DIISOCYANATE**CAS Registry Number:** 822-06-0**Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:**

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1,6-HEXAMETHYLENE DIISOCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT LIVER S-9, AROCLOR 1254 (10%)  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1,6-HEXAMETHYLENE DIISOCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** NONE  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC

ACTIVITY OF 1,6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT LIVER S-9, AROCLOR 1254 (10%)  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1,6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** NONE  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1,6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** RAT LIVER S-9, AROCLOR 1254 (10%)  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1,6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** NONE  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1,6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** CHINESE HAMSTER OVARY CELLS  
**Strain Indicator:** CHO/HGPRT/6-THIOGUANINE

**Metabolic Activation:** NONE  
**Method:** DESICCATOR  
**Dose:** 1-10 ML/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGAIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1, 6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** RAT LIVER S-9, AROCLOR 1254 (10%)  
**Method:** DESICCATOR  
**Dose:** 6-150 UL/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1, 6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

**Test System:** CHINESE HAMSTER OVARY CELLS  
**Strain Indicator:** CHO/HGPRT/6-THIOGUANINE  
**Metabolic Activation:** RAT LIVER S-9, AROCLOR 1254 (10%)  
**Method:** DESICCATOR  
**Dose:** 1-10 ML/DESSICATOR (TEST MATERIAL SOLVENT: N/A)  
**Results:** NEGATIVE  
**Reference:**

[WAGNER, VO SAN, RHC GUDI, R HILASKI, RJ AND JACOBSON-KRAM, D; LACK OF MUTAGENIC ACTIVITY OF 1, 6-HEXAMETHYLENE DIOSCYANATE; TOXICOL. SCI. 55(2):376-382, 2000]

## Administrative Information:

**CCRIS Record Number:** 8431

**Last Revision Date:** 20010301

## Update History:

Complete Update on 03/01/2001, 4 fields added/edited/deleted.

**ISOPHORONE DIISOCYANATE**

CASRN: 4098-71-9

*For other data, click on the Table of Contents***Substance Identification:****Substance Name:** ISOPHORONE DIISOCYANATE**CAS Registry Number:** 4098-71-9**Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:**

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON.

MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 0.3-33 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

### **Administrative Information:**

**CCRIS Record Number:** 6252

**Last Revision Date:** 19950202

### **Update History:**

Complete Update on 02/02/1995, 7 fields added/edited/deleted.

**Appendix 7****1,6-DIAMINOHEXANE**

CASRN: 124-09-4

*For other data, click on the Table of Contents***Substance Identification:****Substance Name:** 1,6-DIAMINOHEXANE**CAS Registry Number:** 124-09-4**Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:****Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** NONE**Method:** PREINCUBATION**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** NEGATIVE**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)**Method:** PREINCUBATION**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** NEGATIVE**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA1535**Metabolic Activation:** NONE**Method:** PREINCUBATION**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)**Results:** NEGATIVE**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 10-6666 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-6666 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8(SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-6666 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON.

MUTAGEN. 8 (SUPPL. 7) :1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-6666 UG/PLATE (TEST MATERIAL SOLVENT: DMSO)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7) :1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7) :1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7) :1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** NONE  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE

**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** HAMSTER, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 33-3333 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA100  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1535  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA1537  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION

**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

**Test System:** AMES SALMONELLA TYPHIMURIUM  
**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, AROCLOR 1254 (10%)  
**Method:** PREINCUBATION  
**Dose:** 100-10000 UG/PLATE (TEST MATERIAL SOLVENT: DISTILLED WATER)  
**Results:** NEGATIVE  
**Reference:**

[MORTELMANS, K, HAWORTH, S, LAWLOR, T, SPECK, W, TAINER, B AND ZEIGER, E; SALMONELLA MUTAGENICITY TESTS: II. RESULTS FROM THE TESTING OF 270 CHEMICALS; ENVIRON. MUTAGEN. 8 (SUPPL. 7):1-119, 1986]

#### **Administrative Information:**

**CCRIS Record Number:** 6224

**Last Revision Date:** 19950202

#### **Update History:**

Complete Update on 02/02/1995, 7 fields added/edited/deleted.

**Appendix 8****ISOPHORONEDIAMINE**

CASRN: 2855-13-2

For other data, click on the Table of Contents

**Substance Identification:****Substance Name: ISOPHORONEDIAMINE****CAS Registry Number: 2855-13-2****Data Type:**

Mutagenicity

**Studies Data:****Mutagenicity Studies:****Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** NONE**Method:** PREINCUBATION**Results:** NEGATIVE**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA100**Metabolic Activation:** RAT, LIVER, S-9, PCB**Method:** PREINCUBATION**Results:** NEGATIVE**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** AMES SALMONELLA TYPHIMURIUM**Strain Indicator:** TA98**Metabolic Activation:** NONE**Method:** PREINCUBATION**Results:** NEGATIVE**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

**Test System:** AMES SALMONELLA TYPHIMURIUM

**Strain Indicator:** TA98  
**Metabolic Activation:** RAT, LIVER, S-9, PCB  
**Method:** PREINCUBATION  
**Results:** NEGATIVE  
**Reference:**

[TAKAHASHI, A AND ONO, H; MUTAGENICITY ASSESSMENT IN 44 EPOXY RESIN HARDENERS IN SALMONELLA TYPHIMURIUM TESTER STRAINS; CHEM. EXPRESS 8(9):785-788, 1993]

### **Administrative Information:**

**CCRIS Record Number:** 6680

**Last Revision Date:** 19950802

### **Update History:**

Complete Update on 08/02/1995, 7 fields added/edited/deleted.

Receipt No. T01-3814

## FINAL REPORT

Hita Laboratory  
Chemicals Evaluation and Research Institute, Japan

**TITLE**

Bacterial Reverse Mutation Test of C-2612 (MSDS)

**SPONSOR**

Nippon Polyuréthane Industry Co., Ltd. Central Research Laboratory  
440, Akiba-cho, Totsuka-ku, Yokohama 245-0052, Japan

**SUMMARY**

The ability of C-2612 to induce mutations was investigated using *Salmonella typhimurium* TA100 and TA98 in a pre-incubation method with and without metabolic activation system (S9 mix). Consequently, the mutagenicity of C-2612 was judged to be negative. The number of revertant colonies was below twice that of each negative control in both test strains.

**SIGNATURE OF AUTHOR**

Study Director:

Signed in original

March 13, 2002

Hifumi Iwashita

STATEMENT

I, the undersigned, hereby declare that this report provides a correct English translation of the final report (Study Code P01-2680 issued on March 13, 2002).

Shozo Ogura

Shozo Ogura

Hita Laboratory

Chemicals Evaluation and Research Institute, Japan

October 10, 2002

Date

Study Code: P01-2680  
Test Substance Code: HR4836  
Sponsor Code: N-390

#### TESTING FACILITY

Hita Laboratory  
Chemicals Evaluation and Research Institute, Japan  
822, 3-chome, Ishii-machi, Hita, Oita 877-0061, Japan

#### PURPOSE OF STUDY

The ability of the test substance to induce mutations is investigated using *Salmonella typhimurium* strains TA100 and TA98.

#### TESTING METHOD

The study was partly conducted in accordance with the testing method described in "Standards for Toxicity Investigations" (Ministry of Labor, Notification No.77, September 1, 1988 and Notification No.67, June 2, 1997), and "Procedures of Mutagenicity Test Using Microorganisms and Evaluation of Test Results" (Ministry of Labor, Official Notification, February 8, 1999).

#### PERIOD OF STUDY

Commencement of Study:	February 19, 2002
Initiation of Experiment:	February 22, 2002
Completion of Experiment:	March 4, 2002
Completion of Study:	March 13, 2002

STUDY DIRECTOR: Hifumi Iwashita  
Mutagenicity Section

#### STORAGE AND RETENTION PERIOD OF DATA

Raw data, protocol, commission, information of test request, final report and other document records will be retained in the archives of Hita Laboratory for 5 years following the date of completion of study. Treatment of data after termination of the retention period will be carried out with the approval of the sponsor.

RETENTION OF ORIGINAL DOCUMENTS

The original protocol will be retained at Hita Laboratory. A copy of the document will be retained by the Sponsor.

The original final report will be retained at Hita Laboratory. A copy of the final report with the relevant certificate of Management in Chemicals Evaluation and Research Institute, Japan will be retained by the Sponsor.

## MATERIALS AND METHODS

### 1. TEST SUBSTANCE (INFORMATION PROVIDED BY THE SPONSOR)

#### 1.1 Name

Carbamic acid, (6-isocyanatohexyl)-,1-methyl-1,3-propanediyl ester

Abbreviation: C-2612

CAS No.: 359013-50-6

#### 1.2 Lot No.

—

#### 1.3 Supplier

Nippon Polyurethane Industry Co., Ltd.

#### 1.4 Structural Formula



(Molecular Formula: — )

#### 1.5 Purity

100%

#### 1.6 Names and Concentration of Impurities

—

#### 1.7 Physicochemical Properties

Appearance at Ordinary Temperature: White wax-like solid

Molecular Weight: 481

Stability: —

Melting Point: —

Boiling Point: —

Vapor Pressure: —

Partition Coefficient: —

Hydrolysis: Unknown

Density: 1.13g/cm<sup>3</sup> (25°C)

Solubility: Soluble in oil

Degree of Solubility: —

#### 1.7 Storage Conditions

Stored in the dark place at room temperature, under nitrogen gas atmosphere.

#### 1.8 Handling Precautions

Gloves, a mask, cap and lab coat were worn.

## 2. BACTERIAL STRAINS

*Salmonella typhimurium* strains TA100 and TA98 were used.

## 3. MEDIUM

### 3.1 Minimal glucose agar plate

Tesmedia AN (Oriental Yeast Industries, Ltd.) was used.

### 3.2 Soft agar

A solution containing 0.5 mM histidine and 0.5 mM biotin was added to a soft agar solution containing 0.6w/v% agar (Bacto Agar, Difco Laboratories) and 0.5w/v% NaCl at a ratio of 1 to 10.

## 4. S9 mix

One mL of S9 mix comprised 8 µmol MgCl<sub>2</sub>, 33 µmol KCl, 5 µmol G-6-P, 4 µmol NADPH, 4 µmol NADH, 100 µmol sodium phosphate buffer (pH 7.4) and 0.1 mL of rat liver S9 (Oriental Yeast Co., Ltd.).

## 5. PRE-CULTURES

A 20-µL aliquot of each of the frozen stock cultures was inoculated to 10 mL of 2.5% Oxoid Nutrient broth No.2 (UNIPATH Ltd.) in L tube, which was incubated at 37±0.5°C for 9 hours by shaking.

## 6. PREPARATION OF TEST SUBSTANCE

### 6.1 Solvent

DMSO(Lot No; KC066)

### 6.2 Preparation

DMSO was added to the test substance to make 50 mg/mL, which was subsequently diluted with the same solvent to give a required concentration series.

### 6.3 Preparation Time

The test substance was prepared immediately before use.

## 7. MUTAGENICITY TEST

The test was conducted using a pre-incubation method with and without S9 mix. Duplicate plates were used for the negative control, the positive controls and the test substance treatment groups.

### 7.1 Procedures

After 0.1 mL of the test substance solution, 0.5 mL of 0.1 M sodium phosphate buffer (pH7.4) or S9 mix and 0.1 mL of bacterial culture were added to a tube, the mixture was shaken for 20 minutes at 37±0.5°C. Two mL of the soft agar was then added to each tube and the mixture was poured onto a minimal glucose agar plate. The number of revertant colonies was counted after an incubation at 37±0.5°C for 48 hours.

As the positive controls without S9mix in TA100 and TA98, 2-(2-Furyl)-3-(5-nitro-2-furyl) acrylamide (AF-2) was employed and the doses were 0.01 µg/plate and 0.1 µg/plate, respectively. A positive control with S9mix was 2-Aminoanthracene (2AA) at 1 µg/plate and 0.5 µg/plate in TA100 and TA98, respectively.

The solvent DMSO was employed as a negative control.

### 7.2 Dose Selection

#### (Main test-1)

A total of 7 doses including the highest dose 5,000 µg/plate and 6 lower doses, 1,581, 500, 158, 50, 15.8 and 5 µg/plate diluted with a geometric progression of  $\sqrt{10}$  were set.

#### (Main test-2)

On the evaluation of the results, it is required to find four or more analysable doses not revealing any bacterial growth inhibition caused by the test substance.

The results of the main test-1 did not show four or more analysable doses owing to the growth inhibition in TA100 with and without S9mix and in TA98 without S9mix.

To secure four or more analysable doses, the main test-2 was carried out at a total of 6 doses including 19.5 µg/plate in TA100 and 156 µg/plate in TA98 without S9mix and 156 µg/plate in TA100 with S9mix as the highest dose, at which the growth inhibition was observed in the main test-1, and 5 lower doses diluted with a geometric progression of 2.

Although more than 4 analysable doses were obtained in TA98 with S9mix of the main test-1, the same test group was also verified in the main test-2 with a total of 6 doses including 625 µg/plate as the highest dose and 5 lower doses diluted with a geometric progression of 2.

## 8. OBSERVATION AND COLONY COUNTING

The precipitates of the test substance and the bacterial growth inhibition were observed with an unaided eye and a stereo microscope, respectively. The number of revertant colonies was counted using a manual counter or a colony analyzer (CV9000, Dennou-Giken Co., Ltd.).

## 9. JUDGEMENT CRITERIA OF TEST RESULTS

The test substance was judged to be positive when the number of revertant colonies increased two times or more than of the negative control in a dose-dependent manner. The other case was judged to be negative.

## TEST RESULTS

### 1. MAIN TEST-1

The test results of the main test-1 were shown in Table1.

The growth inhibition was observed in dose groups more than 15.8 µg/plate in TA100 without S9mix, more than 158 µg/plate in TA98 without S9mix, more than 158 µg/plate in TA100 with S9mix and more than 500 µg/plate in TA98 with S9mix.

The precipitates of the test substance were observed in dose groups more than 1,581 µg/plate without S9mix and at 5,000 µg/plate with S9mix.

In TA98 with S9mix, the number of the revertant colonies did not increase.

The other test groups were inapplicable in evaluating results owing to the growth inhibition, as described in 7.2 Dose Selection.

### 2. MAIN TEST-2

The test results were shown in Table 2.

The growth inhibition was observed in dose groups at 19.5 µg/plate in TA100 and 156 µg/plate in TA98 without S9mix, and at 156 µg/plate in TA100 and 625 µg/plate in TA98 with S9mix.

The precipitates of the test substance were not observed in every dose and test group.

The number of revertant colonies did not increase in TA100 and TA98 with and without S9mix.

## DISCUSSION AND CONCLUSION

Mutagenicity of the test substance, C-2612, was judged to be negative since the number of revertant colonies at each dose level in TA100 and TA98 was below twice that of the negative control with and without S9mix under the present test conditions.

## Table of Bacterial Reverse Mutation Test (Main test-1)

Test substance: C-2612

Test dates		From February 22, 2002 to February 25, 2002		
With (+) or without (-) S9 mix	Test substance dose ( $\mu\text{g}/\text{plate}$ )	Number of revertants per plate		
		Base-pair substitution type	Frameshift type	
		TA 100	TA 98	
-S9 mix	Negative control	101 97 (99)	24 19 (22)	
	5.00	103 99 (101)	32 28 (30)	
	15.8	114* 115* (115)	29 26 (28)	
	50.0	83* 91* (87)	22 15 (19)	
	158	0* 0* (0)	18* 15* (17)	
	500	0* 0* (0)	0* 0* (0)	
	+1581	0* 0* (0)	0* 0* (0)	
	+5000	0* 0* (0)	0* 0* (0)	
+S9 mix	Negative control	102 112 (107)	25 29 (27)	
	5.00	115 106 (111)	30 33 (32)	
	15.8	118 102 (110)	30 37 (34)	
	50.0	103 129 (116)	38 25 (32)	
	158	102* 110* (106)	20 21 (21)	
	500	45* 34* (40)	13* 23* (18)	
	1581	0* 0* (0)	0* 0* (0)	
	+5000	0* 0* (0)	0* 0* (0)	
Positive control -S9 mix	Chemical	AF-2	AF-2	
	Dose ( $\mu\text{g}/\text{plate}$ )	0.01	0.1	
	Number of revertants/plate	245 249 (247)	443 414 (429)	
Positive control +S9 mix	Chemical	2AA	2AA	
	Dose ( $\mu\text{g}/\text{plate}$ )	1	0.5	
	Number of revertants/plate	890 912 (901)	323 309 (316)	

[Notes] Parenthesis shows the mean of each plate.

+: Precipitate of test substance.

\*: Observed bacterial growth inhibition.

• AF-2: 2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide

• 2AA: 2-Aminoanthracene

## Table of Bacterial Reverse Mutation Test (Main test-2)

Test substance: C-2612

Test dates		From February 28, 2002 to March 4, 2002		
With (+) or without (-) S9 mix	Test substance dose ( $\mu\text{g}/\text{plate}$ )	Number of revertants per plate		
		Base-pair substitution type	Frameshift type	TA 98
-S9 mix	Negative control	105 108	(107)	24 21 (23)
	0.610	99 102	(101)	—
	1.22	85 94	(90)	—
	2.44	103 98	(101)	—
	4.88	110 90	(100)	27 20 (24)
	9.77	99 93	(96)	21 27 (24)
	19.5	98* 92*	(95)	17 25 (21)
	39.1	—		13 17 (15)
	78.1	—		16 25 (21)
	156	—		12* 17* (15)
+S9 mix	Negative Control	93 106	(100)	28 36 (32)
	4.88	96 102	(99)	—
	9.77	97 105	(101)	—
	19.5	104 104	(104)	29 33 (31)
	39.1	114 103	(109)	32 37 (35)
	78.1	96 97	(97)	25 25 (25)
	156	80* 81*	(81)	26 26 (26)
	313	—		24 20 (22)
	625	—		19* 17* (18)
Positive control -S9 mix	Chemical	AF-2		AF-2
	Dose ( $\mu\text{g}/\text{plate}$ )	0.01		0.1
	Number of revertants/plate	241 244 (243)		424 503 (464)
Positive control +S9 mix	Chemical	2AA		2AA
	Dose ( $\mu\text{g}/\text{plate}$ )	1		0.5
	Number of revertants/plate	807 827 (817)		313 312 (313)

[Notes] Parenthesis shows the mean of each plate.

\*: Observed bacterial growth inhibition.

• AF-2: 2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide

• 2AA: 2-Aminoanthracene